

ACS Mellon Foundation Faculty Renewal Grants

Final Reporting Guidelines

Mellon Foundation Faculty Renewal Final reports are due within 30 days of the end of the project period **but no later than September 1, 2011**. The due date is in your award email from ACS. Your report should be e- mailed to mwhite@colleges.org for the ACS Faculty Renewal Initiative, 1975 Century Blvd., Suite 10, Atlanta, GA 30345. Fax: 404-636-9558.

Please address the following points in your **separate** ‘detailed narrative’ report with evaluation and dissemination information. (**Do not simply answer the questions by filling in the answers below.**)

Name of Person (s) Submitting Report Min-Ken Liao
E-mail min-ken.liao@furman.edu Phone 864-294-3246
Institution Furman University

Name of project/event Acquiring Technical Skills at the Great Lakes WATER Institute in Milwaukee, Wisconsin

Date(s) of Project: June 2010 to June 2011

Amount Awarded: \$2700

1. Original Goals and objectives
2. If goals/objectives changed during the course of the project, please state the revised goals/objectives.
3. In what ways were the goals/objectives met? Please give examples.
4. Describe the evaluation/assessment process used. Summarize the results of this process? Include any instruments used to evaluate/assess your project.
5. If you were to redesign your project, what would you do differently and why? (What are the “lessons learned?”)
6. How did your project impact other faculty on your campus? If done jointly with one or more institutions, how did it impact faculty on the other campus(es)?
7. How did the project impact the institution (s) as a whole?
8. If students were involved, what was the impact on them?
9. How have you shared the results with ACS colleagues and beyond ACS? Where? At professional meetings, which ones? What are your plans for dissemination **not including posting your report on the ACS website? This is a must answer question.**
10. Did any publications result from this project? If yes, list here.

11. **What are the next steps (follow-up) in your project? Evaluations, surveys etc. are to be included as a part of this report.**
12. **A complete financial statement, showing original budget (the breakdown of the amount awarded) and expenditures.**
13. Please include a brief summary of your work that may be included on the ACS Faculty Renewal website.

Email your report to mwhite@colleges.org
Mellon Faculty Renewal Initiative
Associated Colleges of the South
1975 Century Blvd., Suite 10
Atlanta, GA 30345

There were two goals for my proposal: (1) to learn the most current molecular genetics techniques in freshwater microbial ecology by having hands-on experiences in a leading laboratory in order to enhance research programs in the Biology Department at Furman University, and (2) through the close interactions with scientists (ecologists, microbiologists, environmental physiologists, etc.) in the Great Lakes WATER Institute in Milwaukee, Wisconsin, I hope to familiarize myself with the current research questions and related issues in freshwater microbial ecology so that Dr. Greg Lewis, an ecologist in the Biology Department, and I can develop a course on Disease and Ecology. Both goals were met in June 2011. In this report, I will start with the first goal (Part I) and move on to the second (Part II.)

Part I. My proposed research project changed upon arrival of the WATER institute. Dr. Sandra McLellen and I revisited our original plan and decided that devoting my time there to learn more about *E. coli* genome analysis would benefit my research program at Furman more, and that was what I did. I conducted polymerase chain reactions on hundreds of *E. coli* isolates that Dr. McLellen collected. This technique was not new to me but it needed to be done in order for me to move on to DNA sequencing and genome analysis. DNA sequencing was not new to me, either, but the genome analysis was. I worked closely with Dr. McLellen's postdoctoral fellow, Dr. Ryan Newton, to learn more genomic analyses. There are several commercially available software for the analyses but I cannot afford them, so Ryan and I focused on finding free online ones that are user-friendly.

In addition to the hands-on, bench work, I participated in Dr. McLellen's laboratory meetings. When I arrived, Dr. McLellen and some members of her research group were getting ready to head out to oil-laden Gulf Coast to collect samples. I am not a field biologist so it was fascinating to see how they organized multi-location sampling trips and to help them pack. I also participated in the post-sampling laboratory meetings involving multiple institutes (via Skype) and the experience was an eye-opening one for

my student, Steve McCauley and me; even I had never experience a laboratory meeting at such a scale.

(I asked Steve wrote a one-page reflection. It is attached with the email.)

In addition to hosting me and providing me with the laboratory experiences, Dr. McLellen also let me bring back 100 *E. coli* isolates that she collected from a nearby wastewater treatment plant. This collection has a direct and significant impact on my research program. My research team has been studying the *E. coli* populations in the freshwater and we have been thinking about collecting *E. coli* from wastewater treatment plants for years. We either did not have the time or did not have sufficient funding to do so. Having Dr. McLellen's collection saved us time and money, and the comparisons of this collection to our freshwater collections have helped us to make better conclusions. We have included the comparison in Steve McCauley's oral presentation in the Annual Meeting of Association of Southeastern Biologists. The title of his presentation is "The impact of a poultry processing plant on the concentration of antibiotic-resistant bacteria in a stream in northwestern South Carolina." It was very well received.

(Steve's powerpoint presentation and the abstract of his presentation are attached.)

Dr. Greg Lewis is my colleague and collaborator at Furman University and my experience at the WATER institute has certainly enhanced my knowledge and skills as an environmental microbiologist and made me a better collaborator.

Currently, Steve is preparing a manuscript for publication. In this manuscript, we will include the analysis we got from Dr. McLellen's *E. coli* collection and in the acknowledgement we will certainly mention ACS.

Part II. Being in close proximity with experts in the WATER institute and spending quality time with Dr. McLellen (and being away from Greenville, South Carolina) gave me an opportunity (and time and space) to design a course that is truly interdisciplinary: Infectious Disease Ecology. Like in many liberal arts colleges, the majority of the biology majors at Furman University are interested in careers in allied health. Needless to say, having an Ecology requirement for the biology majors at Furman is not a popular one. To illustrate that ecology is as important as microorganisms to infectious diseases, Dr. Lewis and I decided to offer a course on Infectious Disease Ecology in May 2011. We had nine students enrolled in this three-week course. Our experience was positive and certainly we would like to offer it again.

(Syllabus of the course is attached.)

Conclusion. In short, the goals for this project were met, as demonstrated by the attached documents. In addition, I have learned a great deal about how Dr. McLellen organizes her laboratory personnel and data, and have implemented some in my own research laboratory.

Steve McCauley

Report on experience at the Great Lakes WATER Institute

Several weeks ago, I was able to spend four days at the Great Lakes WATER Institute in Milwaukee, WI with my research professor, Dr. Min-Ken Liao. My time there, though brief, afforded me valuable insights into the inner workings of a large research organization that I'm sure will prove very useful to me going forward. While Furman is a top-notch academic facility, its focus is on undergraduate education and so it doesn't have the same feel as a dedicated research institute like WATER. While at WATER, I was able to sit in on planning meetings and learn how they budgeted available grant money, as well as observe Dr. McLellan's team as they went about their everyday research activities. When I arrived, the team had just returned from a sample collection trip to the Gulf Coast, so it was very interesting to see how they decided which sample sites they were going to process based on how much funding they had available and how different each sample site was from the others. Additionally, I had the opportunity to learn how to use equipment not available in our home lab at Furman and also to practice lab techniques such as gel electrophoresis and PCR. These experiences are invaluable to me, as I will soon have to decide what kind of post-secondary education I wish to pursue. The things I learned in Milwaukee will help ensure that that decision is an informed one. All in all, my trip to the WATER Institute was a truly edifying one and I'm grateful for the chance to have gone.

Impact of a poultry processing plant on the concentration of antibiotic-resistant bacteria in a stream in northwestern South Carolina

Antibiotic-resistant bacteria (ARB) are becoming more prevalent in the environment, possibly due to pollution from humans. For example, the Columbia Farms chicken processing plant in the upper piedmont region of South Carolina has a drainage pipe that discharges water into a headwater branch of Brushy Creek in the Enoree River Basin. Because many chickens are fed antibiotics as part of the agricultural process, there may be residual antibiotics and/or ARB present in this wastewater. We hypothesized that the amount of fecal-indicator bacteria and ARB would increase directly downstream from the point of discharge and then gradually decrease further downstream. We analyzed water samples from upstream and downstream of the effluent input at seven locations, and also from five reference streams (similar size and urban land cover) for comparison. The samples were tested for concentrations of total coliform, *E. coli*, and *Enterococcus* using IDEXX, and cultures of *E. coli* were isolated from filtered samples using EPA standard protocol. The concentrations of indicator bacteria in the tributary formed by the effluent were well above the 95% confidence interval of the data from the reference streams, suggesting that the plant's drainage pipe is indeed introducing bacteria into the environment. However, the concentrations found 430 m downstream from the pipe were within this confidence interval. This could be due to dilution from groundwater sources or settling of the bacteria onto the stream bed. The number of ARB was highest in the plant effluent, with a decrease at sites further downstream, supporting our hypothesis.

BIO 350: Infectious Disease Ecology, May Experience 2011

Course Objective: To gain insights into the impacts of ecosystem changes on emerging and reemerging infectious diseases in animals and plants (both domestic and wild) and how these diseases influence communities, ecosystems, and human welfare.

Instructors

Greg Lewis (x3249, greg.lewis@furman.edu)

Min-Ken Liao (x3246, min-ken.liao@furman.edu)

Requirements and Policies

Academic Integrity: Integrity gives the educational enterprise its legitimacy. Honesty, respect, and personal responsibility are principles that guide academic life at Furman, in and out of the classroom. Academic misconduct in any form (plagiarism, cheating, inappropriate collaboration, and other efforts to gain an unfair academic advantage) threatens the values of the campus community and will have severe consequences, such as failure in the course, and/or suspension or dismissal from the university. If you have any question about what constitutes plagiarism or any other form of academic misconduct, it is your responsibility to consult with us so that you will fully understand what we expect of you in this course. If you have any doubts, ask! You should also be familiar with the information on *Academic Integrity & Plagiarism* and *Academic Integrity at Furman* available at <http://www.furman.edu/integrity/index.htm>. Furman's policy on academic dishonesty can also be found at the same site. The bottom line is: Highest academic integrity is expected. Any violator will FAIL this course without further discussion.

Prerequisite: BIO 221 (Genetics). Be able to apply what you have learned from that course.

Attendance: Although we will not take attendance, perfect attendance is expected. Students with the highest scores typically have perfect or near-perfect attendance. Being absent from or not paying attention in the classroom/lab means that you have actively waived the privilege of getting any assistance from your instructors and are taking full responsibility for your own learning. There will be NO make-up for any missing lecture, field trip, lab exercise, exam, or assignment.

Disability Accommodations: Students with disabilities who need academic accommodations should provide us with notification from the Office of Disability Services (Gina Parris, Coordinator, Admin Bldg 207, phone: 2320 or 2322) by the end of the first week of class.

Learning Assessment: There will be two 90-point **exams** and two 90-point **oral presentations** (one presentation on the ecology of a human disease and a second presentation on the ecology of a non-human disease). At the beginning of four of the labs, there will be a 10-point **lab quiz**. There are 50 points for in-class **participation** and 50 points for an out-of-class **learning journal**. Please prepare a three-ring binder for your learning journal which consists of two parts. Part I is daily reflection in which you write at least a paragraph for this question: In today's lecture, I was intrigued by ____, so I learned ____ from ____ on my own. You will have a chance to share your daily reflection with the class the next day. Part II of the learning journal is presentation preparation in which you include your study notes for the diseases you will present. Every assignment is performed individually except the oral presentations, which can be prepared and given by pairs of students. There will be two presentation styles: conventional and *pecha kucha* (more information will be provided in class).

93% - 100%	A	87% - 89%	B ⁺	80% - 82%	B ⁻	73% - 76%	C	67% - 69%	D ⁺	60% - 62%	D
90% - 92%	A ⁻	83% - 86%	B	77% - 79%	C ⁺	70% - 72%	C ⁻	63% - 66%	D	Below 60%	F

Tentative Schedule		
Date	Lecture (10:00 AM-12:00 noon)	Lab (2:00-4:30 PM)
5/11 W	Lecture: Introduction to principles of microbiology and ecology	
5/12 R	Lecture: Cholera and epidemiology Discussion: Presentation planning	Lab: Koch's postulates (Day 1) (Quiz #1) Discussion: Presentation planning
5/13 F	Lecture: Lyme disease (background) Film: <i>Under Our Skin</i> Lab follow-up: Koch's postulates (Day 2)	
5/16 M	Lecture: The ecology of Lyme disease Lecture: Land use/land cover and disease	
5/17 T	Lecture: Emergence and reemergence of bacterial diseases Discussion: Presentation planning	Lab: Furman Lake sampling Lab: Koch's postulates (Day 3) Lab: IDEXX (Quiz #2)
5/18 W	Lecture: Emergence and reemergence of viral diseases Lab: Koch's postulates (Day 4)	Lab: IDEXX results (10 min)
5/19 R	Lecture: Emergence and reemergence of parasitic diseases	Lab: PCR (Quiz #3), pour plates
5/20 F	Student presentations #1 Lab: gel electrophoresis (PCR results)	
5/23 M	Exam I	
5/24 T	Lecture: Pathogens and ecosystem function	Lab quiz
5/25 W	Centers for Disease Control and Prevention, all-day field trip	
5/26 R	Field trip: Collecting water samples (off campus)	Lab: Process water samples (EPA method), IDEXX, and PCR
5/27 F	Lecture: Climate change, disease, and extinction Lab: Gel electrophoresis for PCR results, count colonies, etc.	Lab: IDEXX results (10 min)
5/30 M	<i>No class - Memorial Day holiday</i>	
5/31 T	Lecture: Ecological management of disease Lecture: Methods and techniques Course evaluations	Lab: Data analysis Student presentations #2
6/1 W	Exam II	